CLAIMS

What is claimed is:

1   1.   A method comprising:

2   accessing a first multi-dimensional graphical representation that describes the

3   appearance of a plurality of points of an object from a plurality of

4   viewing directions, the appearance varying from point to point and

5   viewing direction to viewing direction;

6   creating a second graphical representation that approximates the first graphical

7   representation and that includes at least one expression having a fewer

8   dimensions than the first multi-dimensional graphical representation by

9   decomposing the first multi-dimensional graphical representation into

10   the second graphical representation, the decomposing including

11   selectively representing information from the first graphical

12   representation.

1   2.   The method of claim 1, further comprising expressing the first graphical

2   representation as a matrix, and wherein creating the second graphical

3   representation includes using singular value decomposition to decompose the

4   first multi-dimensional graphical representation into a first vector multiplying a

5   second vector.

1   3.   The method of claim 1, wherein creating by decomposing includes selectively

2   representing information from the first graphical representation that is most

3   important to describe the appearance of the object and neglecting redundant

4   information from the first graphical representation that is less important to

5   describe the appearance of the object.

1 4. The method of claim 1, further comprising:

2 accessing a third multi-dimensional graphical representation that describes the

3 appearance of a second plurality of points of the object from a plurality

4 of viewing directions, the second plurality of points including the first

5 plurality of points, and the appearance varying from point to point and

6 viewing direction to viewing direction; and

7 partitioning the third multi-dimensional graphical representation into a

8 plurality of smaller multi-dimensional graphical representations each

9 associated with a primitive of a polygonal representation of the

10 geometry of the object, the plurality of smaller multi-dimensional

11 graphical representations including the first multi-dimensional

12 graphical representation.

1 5. A method comprising:

2 accessing a first graphical representation that describes the appearance of a

3 plurality of points on an object;

4 creating a second graphical representation based on the first graphical

5 representation, the second graphical representation containing less

6 redundant descriptive information than the first graphical

7 representation, and the second graphical representation containing a

8 plurality of portions that are capable of being concurrently combined to

9 display the plurality of points of the object with an appearance

10 associated with a particular viewing direction.

1 6. The method of claim 5, wherein the first graphical representation describes the

2 appearance of a plurality of points of an object from a plurality of viewing

3 directions, the appearance varying from point to point and viewing direction to

4 viewing direction.

1 7. The method of claim 5, wherein creating includes creating a second graphical

2 representation that includes a plurality of portions capable of being expressed

3 as matrices, the method further comprising expressing the plurality of portions

4 as matrices.

1 8. The method of claim 5, further comprising:

2 storing the second graphical representation;

3 receiving a request on a network for the second graphical representation;

4 transmitting the second graphical representation on the network after receiving

5 the request.

1 9. The method of claim 5, wherein creating includes creating a second graphical

2 representation that includes a plurality of portions that can be combined using

3 multitexturing hardware that allows multiple textures to be concurrently

4 applied to a primitive in a single rendering pass.

1 10. The method of claim 5, wherein creating includes creating a second graphical

2 representation that includes a plurality of portions that are capable of being

3 concurrently combined without decompressing the plurality of portions.

1 11. The method of claim 5, further comprising:

2 accessing a third graphical representation that describes the appearance of a

3 second plurality of points of the object from a plurality of viewing

4 directions, the second plurality of points including the first plurality of

5   points, and the appearance varying from point to point and viewing

6   direction to viewing direction; and

7   partitioning the third graphical representation into a plurality of smaller

8   graphical representations each associated with at least one primitive of

9   a polygonal representation of the geometry of the object, the plurality

10   of smaller multi-dimensional graphical representations including the

11   first multi-dimensional graphical representation.

1   12.   A machine-readable medium having stored thereon data representing

2   sequences of instructions that when executed cause a machine to perform

3   operations comprising:

4   accessing a first graphical representation that describes the appearance of a

5   plurality of points on an object;

6   creating a second graphical representation based on the first graphical

7   representation, the second graphical representation containing less

8   redundant descriptive information than the first graphical

9   representation, and the second graphical representation containing a

10   plurality of portions that are capable of being concurrently combined to

11   display the plurality of points of the object with an appearance

12   associated with a particular viewing direction.

1   13.   The machine-readable medium of claim 12, wherein the instructions for

2   accessing the first graphical representation further comprise instructions

3   causing the machine to perform operations comprising accessing a first

4   graphical representation that describes the appearance of a plurality of points

5   of an object from a plurality of viewing directions, the appearance varying

6   from point to point and viewing direction to viewing direction.

1   14.   The machine-readable medium of claim 12, wherein the instructions for

2   creating further comprise instructions causing the machine to perform

3   operations comprising creating a second graphical representation that includes

4   a plurality of portions capable of being expressed as matrices.

1   15.   The machine-readable medium of claim 12, wherein the instructions for

2   creating further comprise instructions causing the machine to perform

3   operations comprising creating a second graphical representation that includes

4   a plurality of portions that can be combined using multitexturing hardware that

5   allows multiple textures to be concurrently applied to a primitive in a single

6   rendering pass.

1   16.   The machine-readable medium of claim 12, wherein the instructions for

2   creating further comprise instructions causing the machine to perform

3   operations comprising creating a second graphical representation that includes

4   a plurality of portions that are capable of being concurrently combined without

5   decompressing the plurality of portions.

1   17.   The machine readable medium of claim 12, wherein the instructions further

2   comprise instructions causing the machine to perform operations comprising:

3   accessing a third graphical representation that describes the appearance of a

4   second plurality of points of the object from a plurality of viewing

5   directions, the second plurality of points including the first plurality of

6   points, and the appearance varying from point to point and viewing

7   direction to viewing direction; and

8   partitioning the third graphical representation into a plurality of smaller

9   graphical representations each associated with at least one primitive of

10   a polygonal representation of the geometry of the object, the plurality

11   of smaller multi-dimensional graphical representations including the

12   first multi-dimensional graphical representation.

1   18.   A method comprising:

2   accessing image-based data for an object that describes the appearance of the

3   object from a plurality of viewing directions;

4   dividing the image-based data into a plurality of smaller portions associated

5   with regions on the object;

6   standardizing each of the plurality of smaller portions;

7   creating a plurality of approximate graphical representations that approximate

8   the plurality of standardized portions by selectively representing certain

9   non-redundant information from each of the plurality of standardized

10   portions; and

11   storing each of the plurality of approximate graphical representations.

1   19.   The method of claim 18:

2   wherein dividing the image-based data includes partitioning the image-based

3   data into a plurality of subsets of image-based data, each subset of

4   image-based data describing the appearance of a primitive-defined

5   region of the object for a particular viewing direction, each subset

6   having a higher degree of spatial coherency than the set of image-based

7   data;

8   wherein standardizing includes normalizing the size of each of the plurality of

9   subsets of image-based data to a predetermined size, normalizing the

10   shape of each of the plurality of subsets of image-based data to a

11   predetermined shape, and using the plurality of subsets of image-based

12   data to compute a resampled plurality of subsets of image-based data

13   that correspond to predetermined standardized viewing directions; and

14   wherein creating a plurality of approximate graphical representations includes

15   creating for each primitive-defined region a first data structure that is

16   independent of the viewing direction and a second data structure that

17   includes a plurality of portions that each correspond to a different

18   viewing direction.

1   20.   The method of claim 18, further comprising:

2   acquiring geometry data for an object that describes the geometric extents of

3   the surface of the object;

4   converting the geometry data into a geometric representation of the geometry

5   of the object; and

6   acquiring image-based data that describes the appearance of the surface of the

7   object from a plurality of viewing directions.

1   21.   The method of claim 18, further comprising:

2   receiving a request for graphical content associated with the object from

3   another computer system;

4   transmitting a plurality of approximate graphical representations to the other

5   computer system; and

6   transmitting geometry data for the object to the other computer system.

1   22.   A data structure comprising at least a first portion and a second portion, the

2   second portion including a second plurality of view-dependent subportions

3   including a first view-dependent subportion that corresponds to a first viewing

4   direction and a second view-dependent subportion that corresponds to a second
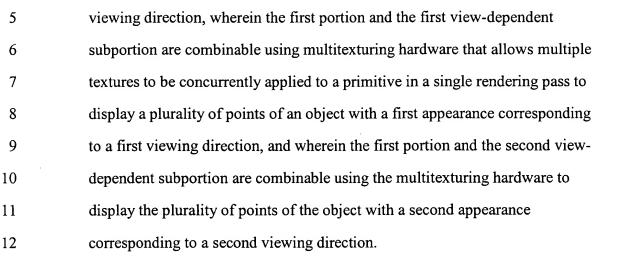
5   viewing direction, wherein the first portion and the first view-dependent

6   subportion are combinable using multitexturing hardware that allows multiple

7   textures to be concurrently applied to a primitive in a single rendering pass to

8   display a plurality of points of an object with a first appearance corresponding

9   to a first viewing direction, and wherein the first portion and the second view-

10   dependent subportion are combinable using the multitexturing hardware to

11   display the plurality of points of the object with a second appearance

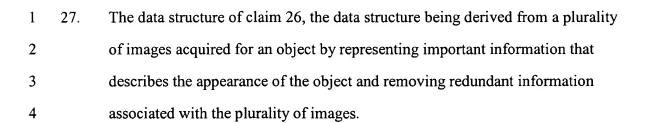12   corresponding to a second viewing direction.

1   23.   The data structure of claim 22, wherein the data structure is derived from a

2   plurality of images acquired for the object by selectively representing

3   information from the plurality of images that is important to describe the

4   appearance of the object and selectively removing information from the

5   plurality of images that is redundant.

1   24.   The data structure of claim 22, wherein the first portion and the first view-

2   dependent subportion are combinable without decompression using the

3   multitexturing hardware.

1   25.   The data structure of claim 22, wherein the first portion and the second portion

2   are created by decompressing a corresponding compressed first portion and a

3   corresponding compressed second portion of another data structure.

1   26.   A data structure comprising a plurality of portions that are combinable without

2   interpolation to display a plurality of points of the object with a first

3   appearance for a first viewing direction and display the plurality of points with

4   a second appearance for a second viewing direction.

1   27.   The data structure of claim 26, the data structure being derived from a plurality

2   of images acquired for an object by representing important information that

3   describes the appearance of the object and removing redundant information

4   associated with the plurality of images.

1   28.   The data structure of claim 26, wherein the plurality of portions are

2   combinable without decompression.

1   29.   The data structure of claim 26, wherein the plurality of portions are created by

2   decompressing corresponding compressed portions of another data structure.

1   30.   The data structure of claim 26, wherein the plurality of portions include a first

2   matrix and a second matrix that are concurrently combinable using

3   multitexturing hardware that allows multiple textures to be concurrently

4   applied to a primitive in a single rendering pass.